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EFFECTS OF WARM, COOL, AND NEUTRAL COLORS ON SHORT TERM MEMORY IN YOUNG CHILDREN

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ABSTRACT

This study investigates the impact of different color stimuli (neutral, warm, and cool) on short-term memory retention in children aged 9-10. A sample of 50 children was tested under varying color conditions, where participants viewed slides with different colored backgrounds (black for neutral, red for warm, and purple for cool) and recalled the words presented. The purpose of the research was to determine how these color conditions affect memory retention. Findings revealed that cool colors, particularly purple, significantly enhance memory retention more effectively than warm (red) and neutral (black) colors. These results suggest that incorporating cool colors into educational materials and environments can optimize learning by improving short-term memory retention. This study highlights the importance of considering environmental factors, such as color, in designing educational strategies and classroom settings to support cognitive development. The principal results indicate that specific color stimuli can positively influence cognitive functions in children, providing empirical insights for educators and curriculum developers. Major conclusions from this research include the potential benefits of using cool colors like purple in educational contexts to enhance memory performance and learning outcomes. Future research should explore the impact of various sensory stimuli on cognitive processes across different developmental stages to further refine educational practices. By understanding the relationship between color and memory, this study contributes to the development of targeted interventions aimed at improving cognitive performance and educational experiences for children.

KEYWORDS: Color Stimuli, Short-Term Memory, Children, Cognitive Development, Educational Strategies, Memory Retention.

INTRODUCTION

Color significantly impacts human perception and cognition, influencing processes such as memory retention. Short-term memory, the ability to temporarily store and retrieve information, is particularly susceptible to such influences. Previous research has shown that color can affect memory performance, with some studies indicating that certain colors can enhance or impair cognitive functions. For example, Smilek et al. (2002) and Greene et al. (1983) demonstrated that color impacts memory recall, but findings have been inconsistent.

Memory capabilities in children undergo significant changes during early development. Research indicates that children aged 5 to 7 remember more than 60% of experienced events, but this ability declines to less than 40% by ages 8 and 9 (Nelson & Ross, 1980). This decline raises questions about factors influencing memory retention in children and highlights the need for potential interventions.

Despite numerous studies on adults and adolescents, there is a gap in understanding how color influences short-term memory in younger children. This research aims to fill that gap by investigating whether exposure to different colors can improve short-term memory in children aged 9-10 years. By examining how varying color stimuli affect memory retention and recall abilities, this study seeks to provide empirical insights to inform educational strategies and curriculum design.

The decision to focus on 9 to 10-year-old children stems from their crucial stage of cognitive development, where memory abilities are actively maturing. Understanding the impact of environmental cues, like color, on cognitive processes in this age group offers strategic opportunities to enhance classroom design and educational outcomes. This study aims to bridge the gap between theoretical knowledge and practical application, offering practical implications for educators and policymakers interested in optimizing learning environments to foster improved memory retention and cognitive functioning in children.

METHODOLOGY

Research Design:

This research was conducted to find out the short-term memory for which children of age 9-10 were assessed. The sample population was 50 students.

Prior to the main study, a pilot study was conducted with a smaller sample of children from the target age group to refine experimental procedures and ensure feasibility. The pilot study focused on testing the protocol for administering color stimuli and measuring short-term memory recall. Feedback from the pilot study participants and observations by researchers were instrumental in adjusting several aspects of the study. Specifically, the duration of exposure to color stimuli was optimized, ensuring it was sufficient for potential effects to manifest without overwhelming participants. Instructions given

to the children were clarified and simplified based on participant feedback to ensure comprehension and minimize confusion during the tasks. Additionally, adjustments were made to the memory assessment tasks to ensure they were appropriate for the developmental stage of the children involved. These refinements through the pilot study process significantly enhanced the experimental design and methodology, ultimately increasing the reliability and validity of the data collected during the main study.

Participants:
A stratified random sampling method was employed to select 50 participants aged 9-10 years. This method ensured a representative sample reflecting the diversity and developmental stages typical of this age group.

Procedure:
Participants were brought to a quiet room to view 18 slides, each displayed for 5 seconds. The slides featured words against backgrounds of different colors: neutral (black), warm (red), and cool (purple). Each category consisted of six slides. Participants were instructed to remember as many words as possible from each slide. The sequence of slides was randomized for each participant to minimize order effects.

After viewing all 18 slides, participants immediately recalled the words they remembered. Their responses were recorded using a checklist corresponding to the words shown. Following this initial recall, participants viewed the same 18 slides again and recalled any words they might have forgotten from the first round. This second recall phase provided insights into short-term memory retention.

Materials:
Computer or Projector: A computer with a presentation software to display the slides containing the words. This ensures standardized and controlled presentation of stimuli to participants.

Slides with Words: Digitally displayed slides, each containing different words chosen randomly. These slides are designed to display one word prominently for 5 seconds each.

Checklist or Recording Sheet: A checklist or recording sheet to track and record participants' responses during the memory recall tasks. This sheet has a list of all words presented on the slides for easy marking.

Quiet Room or Testing Environment: A quiet room or controlled testing environment where participants can focus on the task without distractions. This helps maintain concentration and reduces external influences on memory recall.

Writing Materials: Pens or pencils for experimenters to use when marking the participants recalled words on the checklist or recording sheet. This allows for efficient data collection during and after the memory tasks.

RESULT & DISCUSSION

Results:
The study examined the impact of neutral (black), warm (red), and cool (purple) color backgrounds on short-term memory retention in children aged 9-10 years. Participants viewed slides with words displayed against these different colored backgrounds and then recalled the words.

Color Category	Color	Mean Total
Neutral	Black	3.64
Warm	Red	3.98
Cool	Purple	4.06

Table 1: Mean Scores for Memory Retention Across Different Colors

Neutral Colors (Black):
The mean total score for the black background was 3.64, with individual scores of 2.02 for black letters and 1.62 for the black background condition. This combination yielded the lowest mean total among the three experimental conditions, indicating that the effectiveness of this combination on short-term memory retention was comparatively lower.

Warm Colors (Red):
The mean total score for the red background was 3.98, with scores of 1.86 for red letters and 2.12 for the red background condition. This combination ranked in the middle range, suggesting that warm colors like red have a moderate impact on short-term memory retention.

Cool Colors (Purple):
The mean total score for the purple background was 4.06, with scores of 2.20 for purple letters and 1.86 for the purple background condition. This combination ranked highest among the three-color categories, suggesting that cool colors like purple are particularly effective in enhancing short-term memory retention among children.

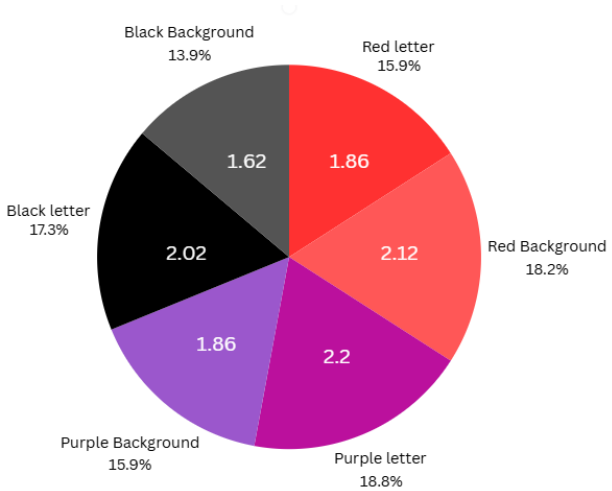

Figure 1: Pie Chart: Illustrates the mean scores of different colors (black, red, and purple) on memory retention in children.

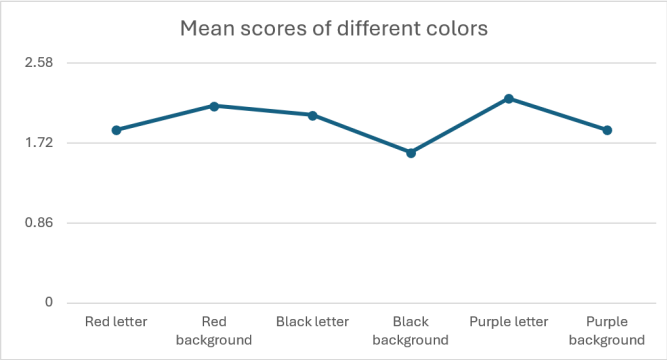

Figure 2: Line Graph: Illustrates the mean scores of different colors (black, red, and purple) on memory retention in children

CONCLUSION AND DISCUSSION:

The results of this study indicate that color stimuli have a significant impact on short-term memory retention in children aged 9-10 years. Specifically, cool colors (e.g., purple) were found to enhance memory retention more effectively than both warm (e.g., red) and neutral (e.g., black) colors.

Neutral Colors:

The neutral color category, represented by black, produced the lowest mean score. This finding aligns with previous research suggesting that neutral colors have a minimal impact on cognitive performance and memory retention.

Warm Colors:

Warm colors, such as red, resulted in a moderate mean score, reflecting their stimulating qualities. While previous studies have emphasized the arousing properties of warm colors and their potential to enhance attention and memory (Elliot & Maier, 2014; Greene et al., 1983), our findings suggest that their effect on short-term memory is less pronounced than that of cool colors.

Cool Colors:

Cool colors, represented by purple, demonstrated the highest mean score, indicating their superior impact on enhancing short-term memory retention. This supports psychological theories that suggest cool colors create a calming and soothing environment, facilitating concentration and memory consolidation (Elliot & Maier, 2014). Our results are consistent with previous research showing that cool colors can improve memory performance in various age groups (Smilek et al., 2002; Rogahang et al., 2016).

IMPLICATIONS FOR EDUCATIONAL SETTINGS

The findings suggest that incorporating cool colors like purple into educational environments could optimize learning outcomes related to memory tasks. For instance, painting classroom walls in shades of purple or integrating purple hues into learning materials could create a conducive atmosphere for cognitive development. Additionally, using purple in digital learning platforms or interactive displays may offer visually engaging experiences that support cognitive engagement and information processing.

LIMITATIONS AND FUTURE RESEARCH

Several limitations should be considered. The sample size of 50 participants may not fully represent the diversity within the child population, potentially affecting the generalizability of the findings. Additionally, the controlled laboratory setting may not fully replicate real-world educational environments, where factors like classroom dynamics, ambient lighting, and teacher interactions could interact with color effects differently. Future research should aim to replicate these findings in diverse educational environments, explore individual differences in color perception and preferences, and employ robust statistical analyses, such as ANOVA, to further elucidate the effects of color on memory performance.

Overall, this study contributes to a deeper understanding of how color stimuli can be leveraged to support cognitive development and enhance educational outcomes in children. By incorporating insights from color psychology into classroom design and learning materials, educators and curriculum planners can create stimulating yet calming atmospheres that promote effective learning and foster student achievement.

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